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(54) **CHANGING DEVICE FOR COATING MEDIA AND COATING SYSTEM FOR COATING OBJECTS**

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(58) **Field of Classification Search**
None
See application file for complete search history.

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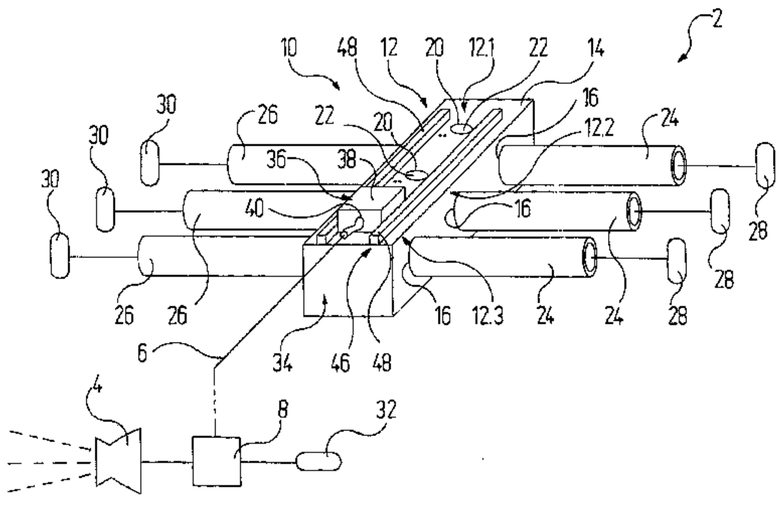
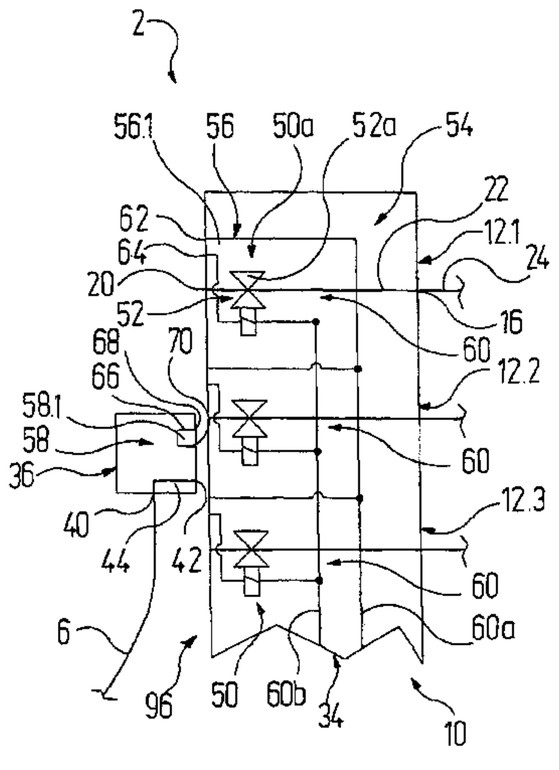
(57) **ABSTRACT**

A changing device for coating media having a plurality of supply units. The device includes an electric valve device with each supply unit having an electric valve unit which opens and closes a flow channel through which a medium may be supplied in response to a control signal. The valve device includes a control system which has a switching device for each supply unit, each switching device selectively allowing or blocking a control signal from reaching a respective valve unit. The valve device also includes a triggering device which is carried by at least one coupling unit which couples the plurality of supply units to an application device. The triggering device triggers the switching device to allow the control signal through to a supply unit when the coupling unit is connected to the supply unit in a fluid-tight manner.

4 Claims, 9 Drawing Sheets





(51) **Int. Cl.**

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B05B 5/16	(2006.01)
B05B 15/55	(2018.01)

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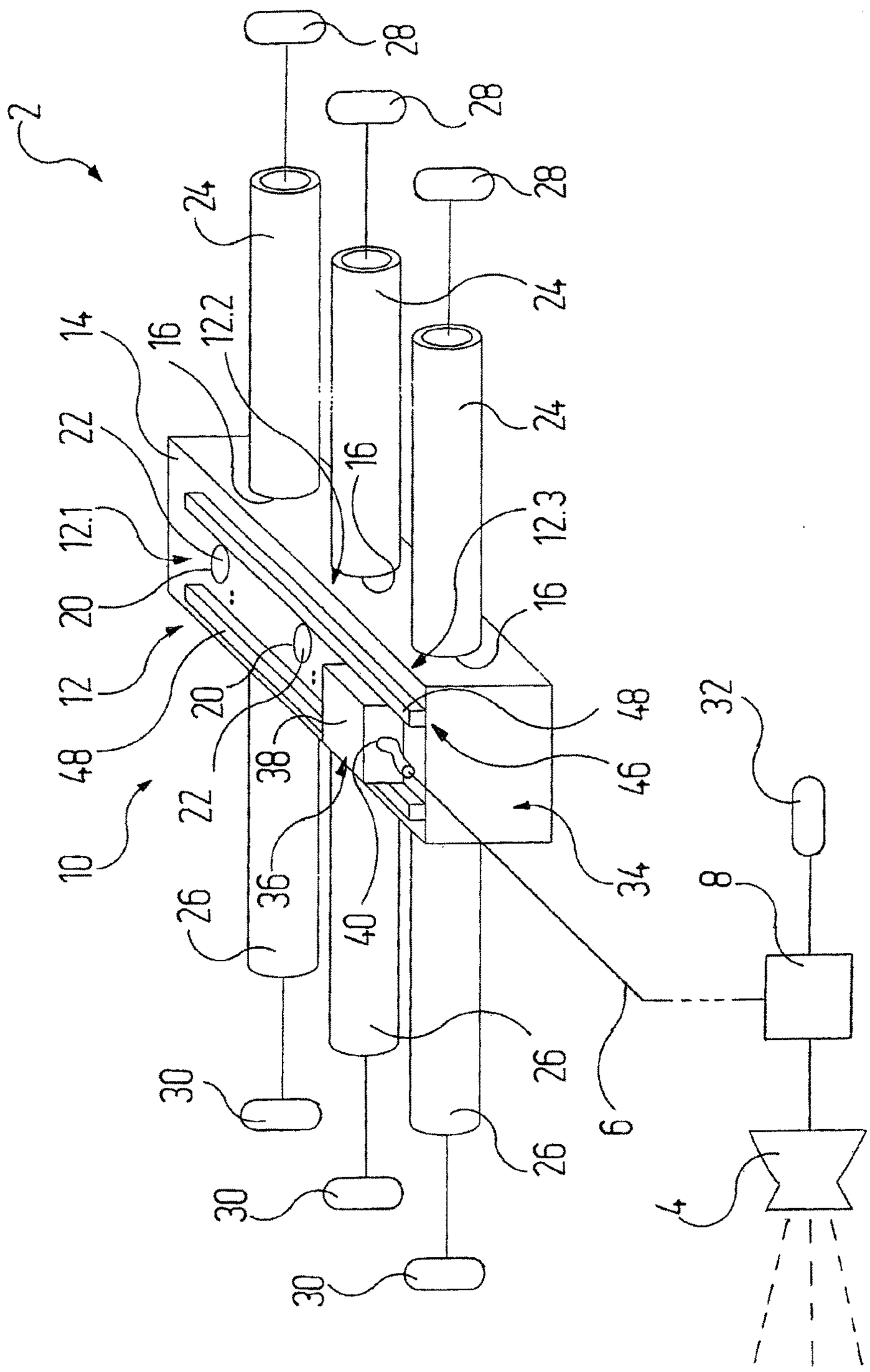
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Fig. 1

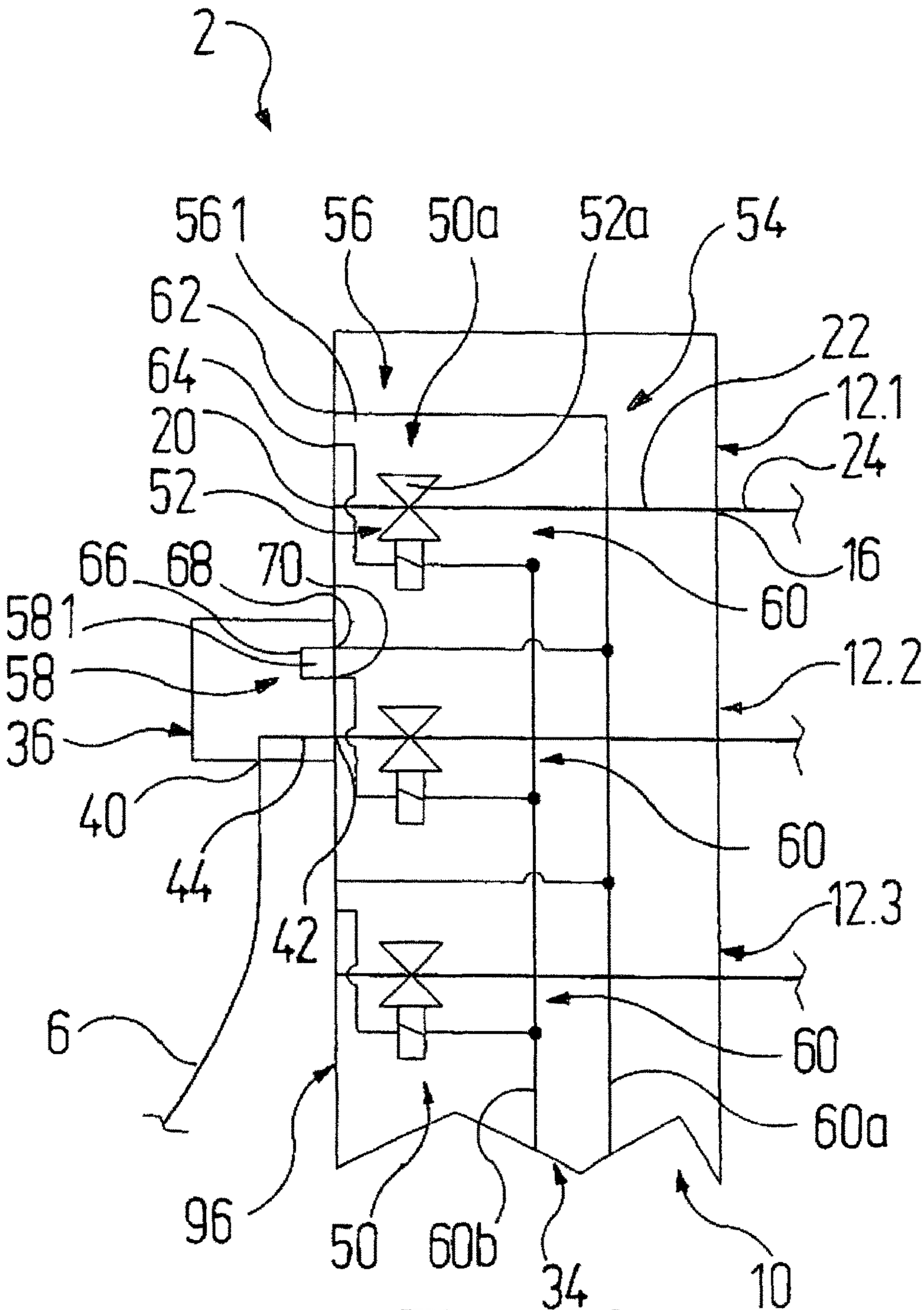
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Fig. 2A

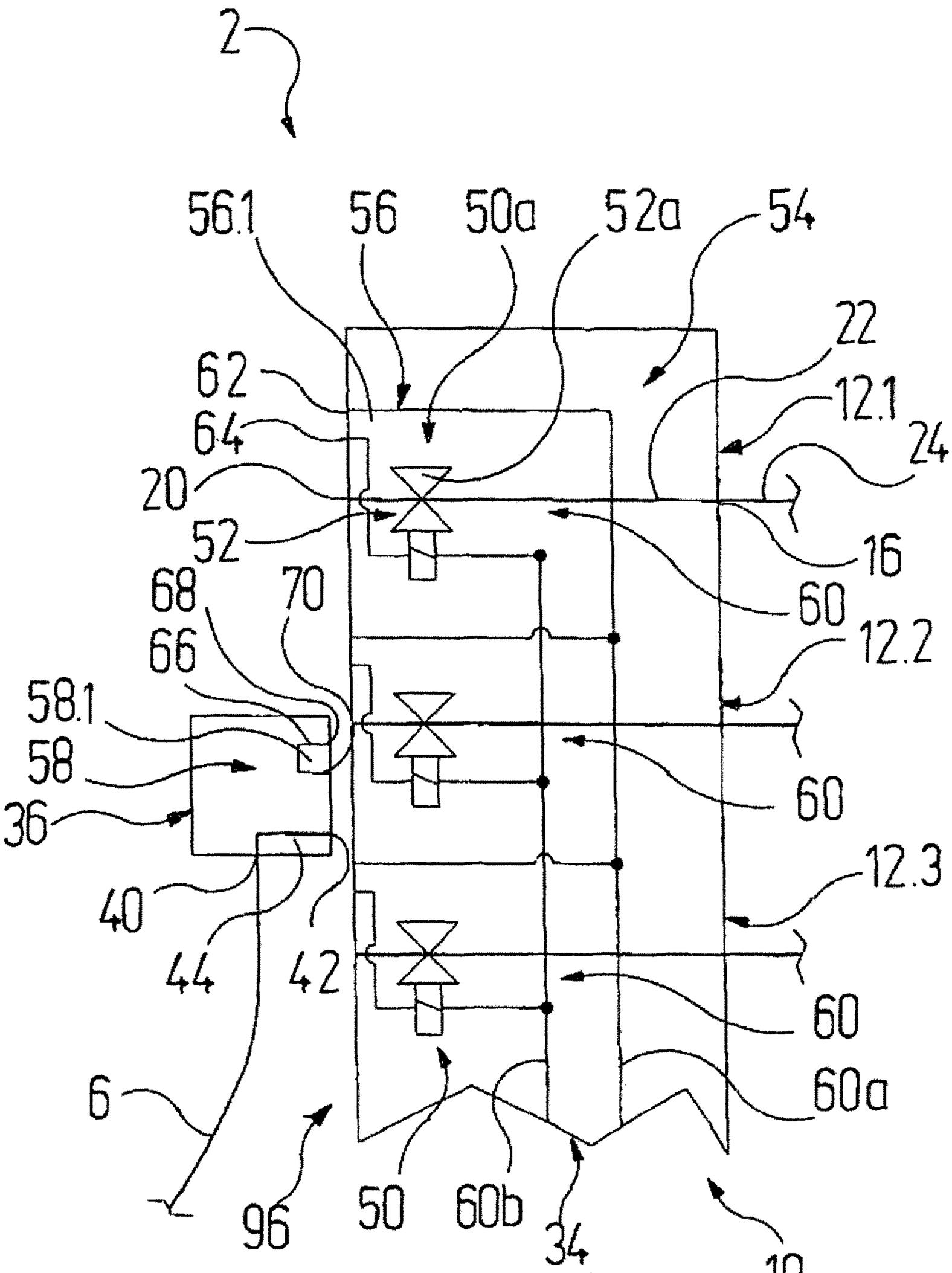
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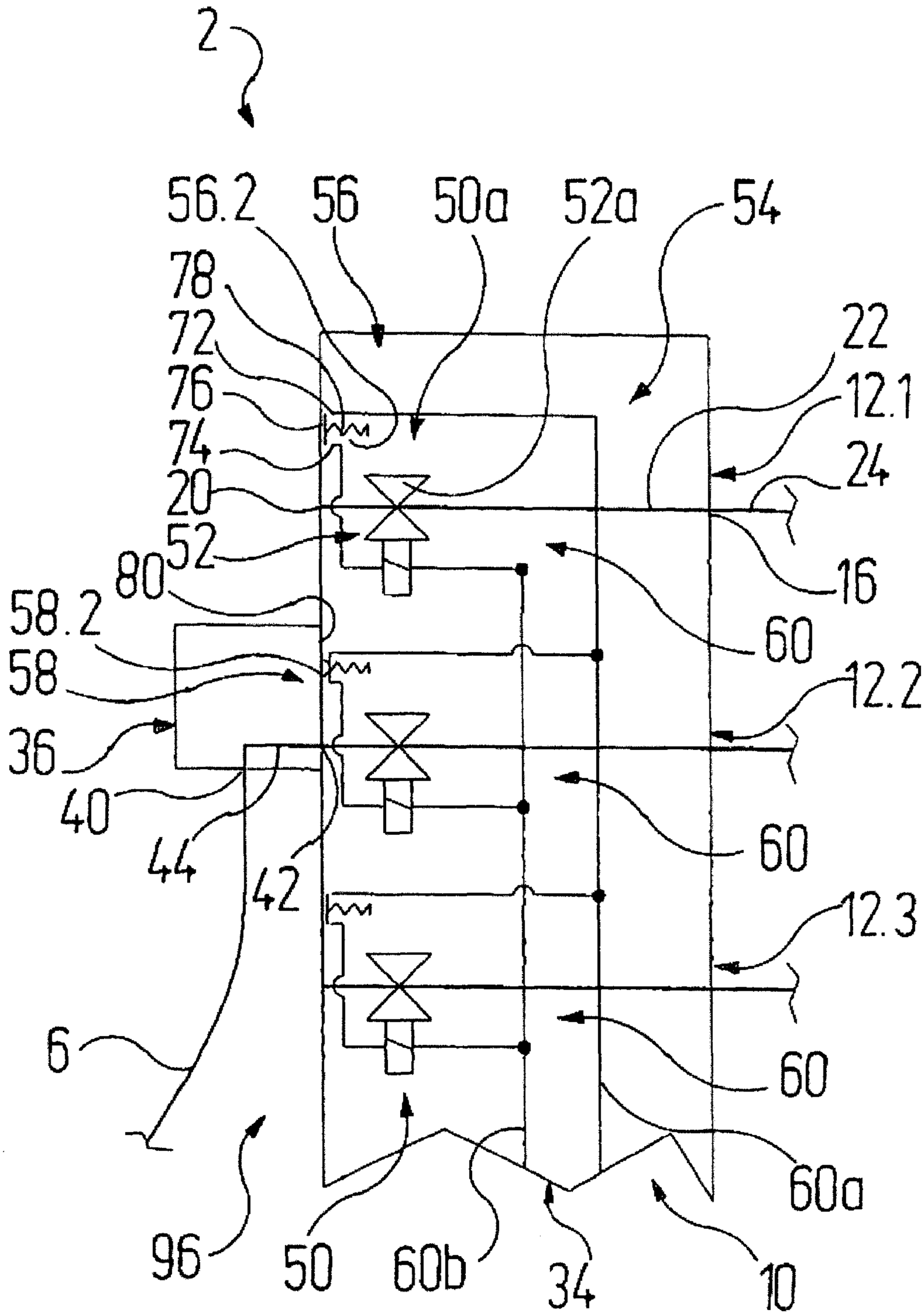
Fig. 2B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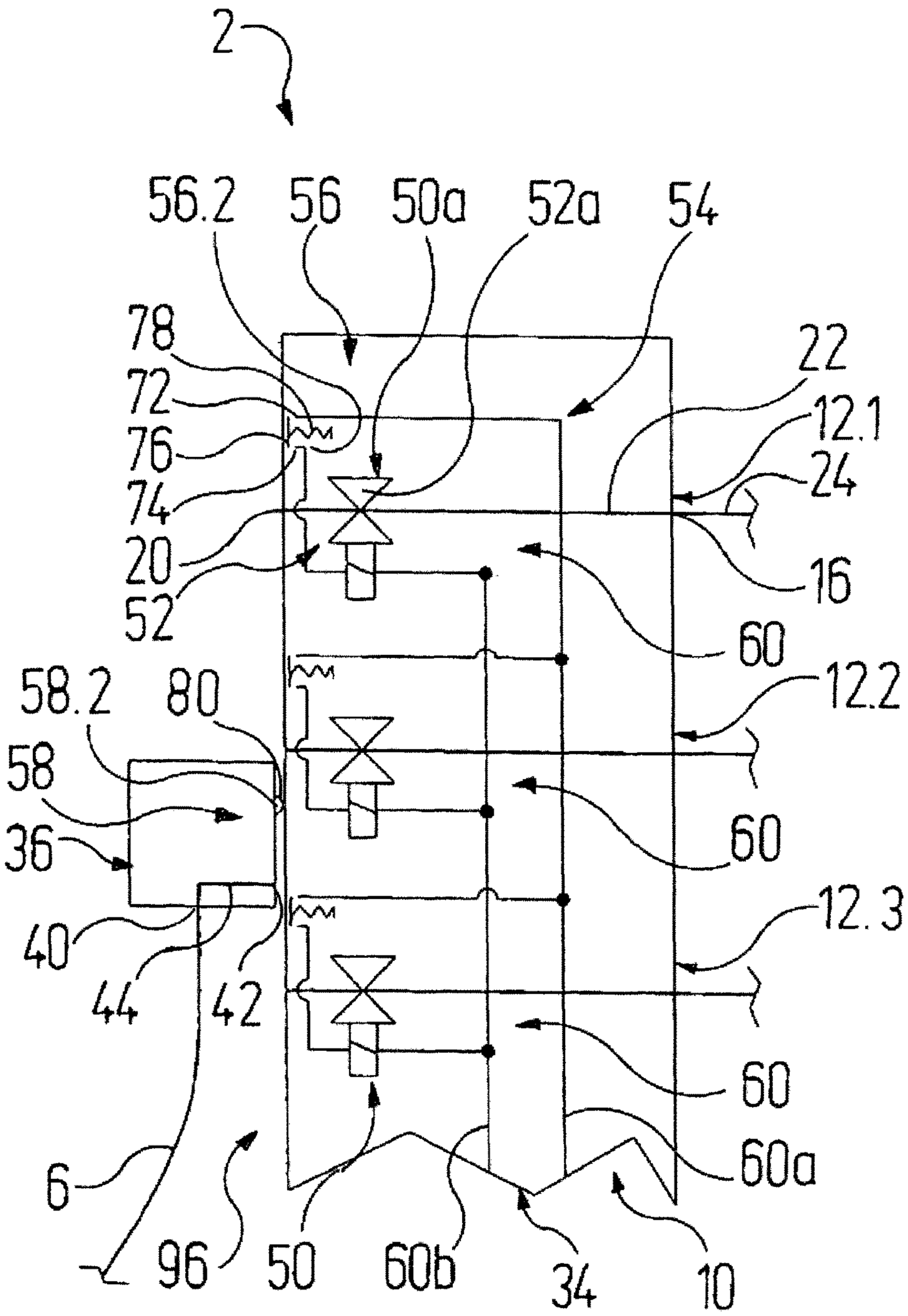
60a

Fig. 3A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12.2
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12.3
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60a

Fig. 3B

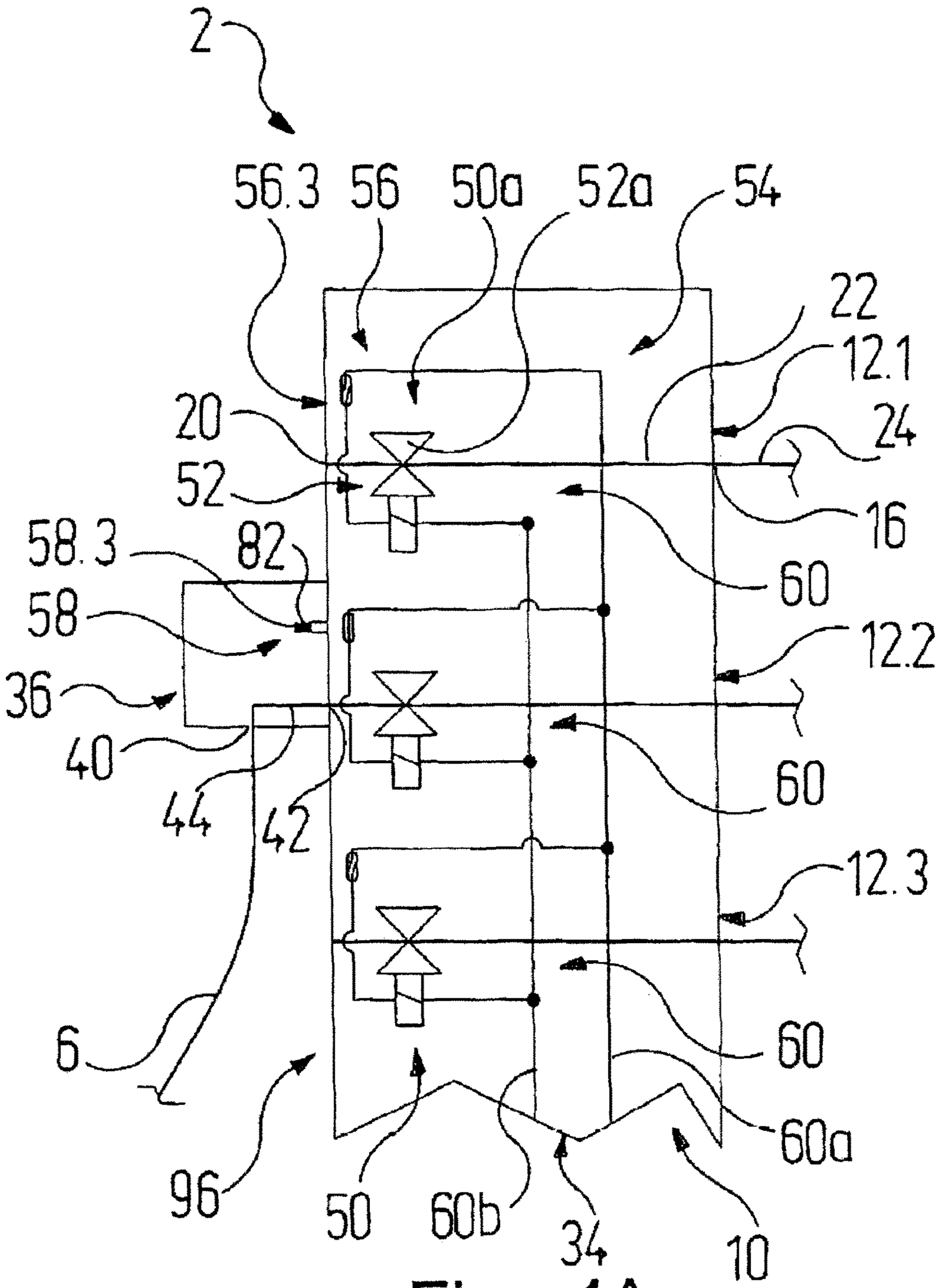
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Fig. 4A

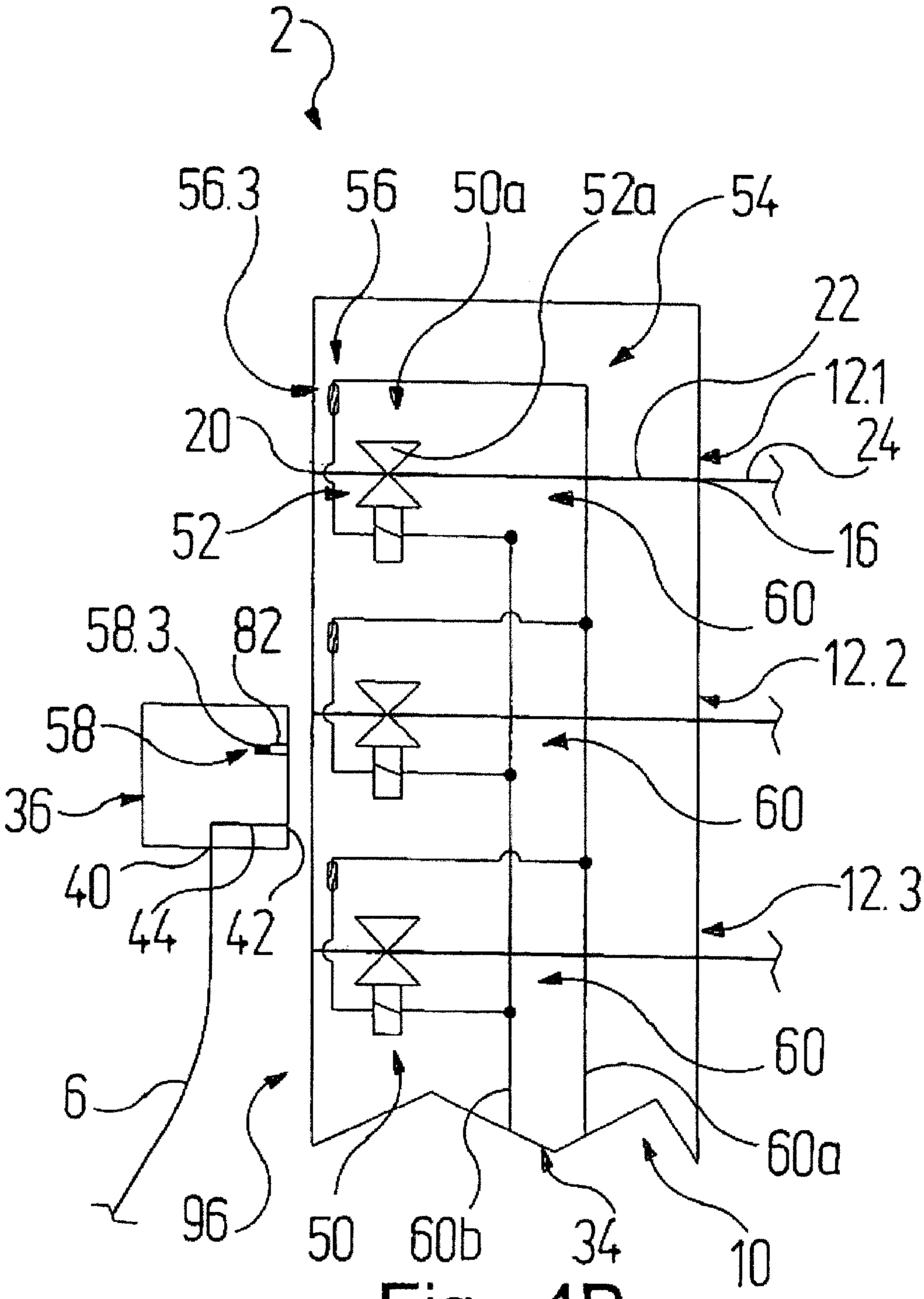
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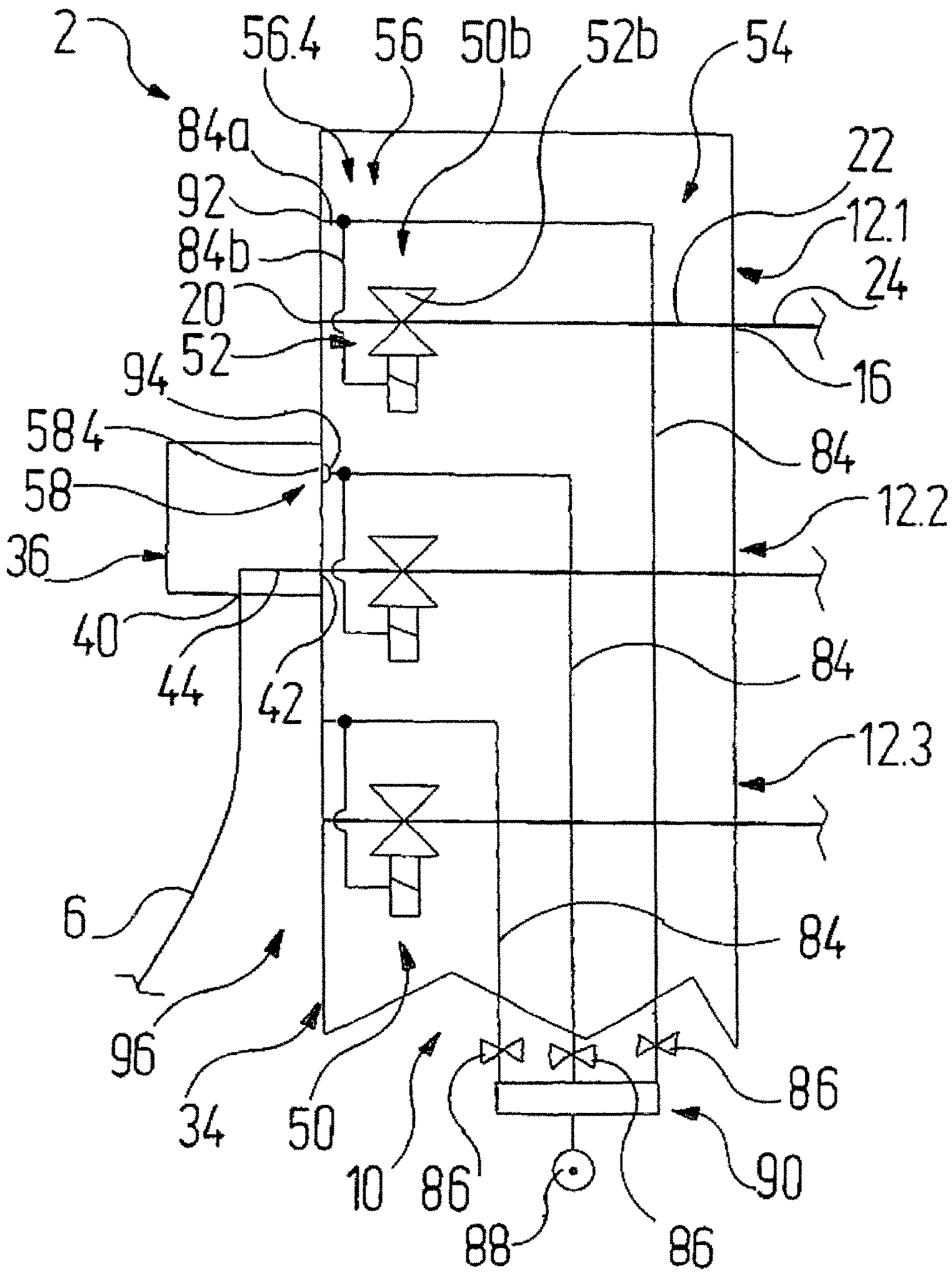
Fig. 4B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96
34
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12.1
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12.2
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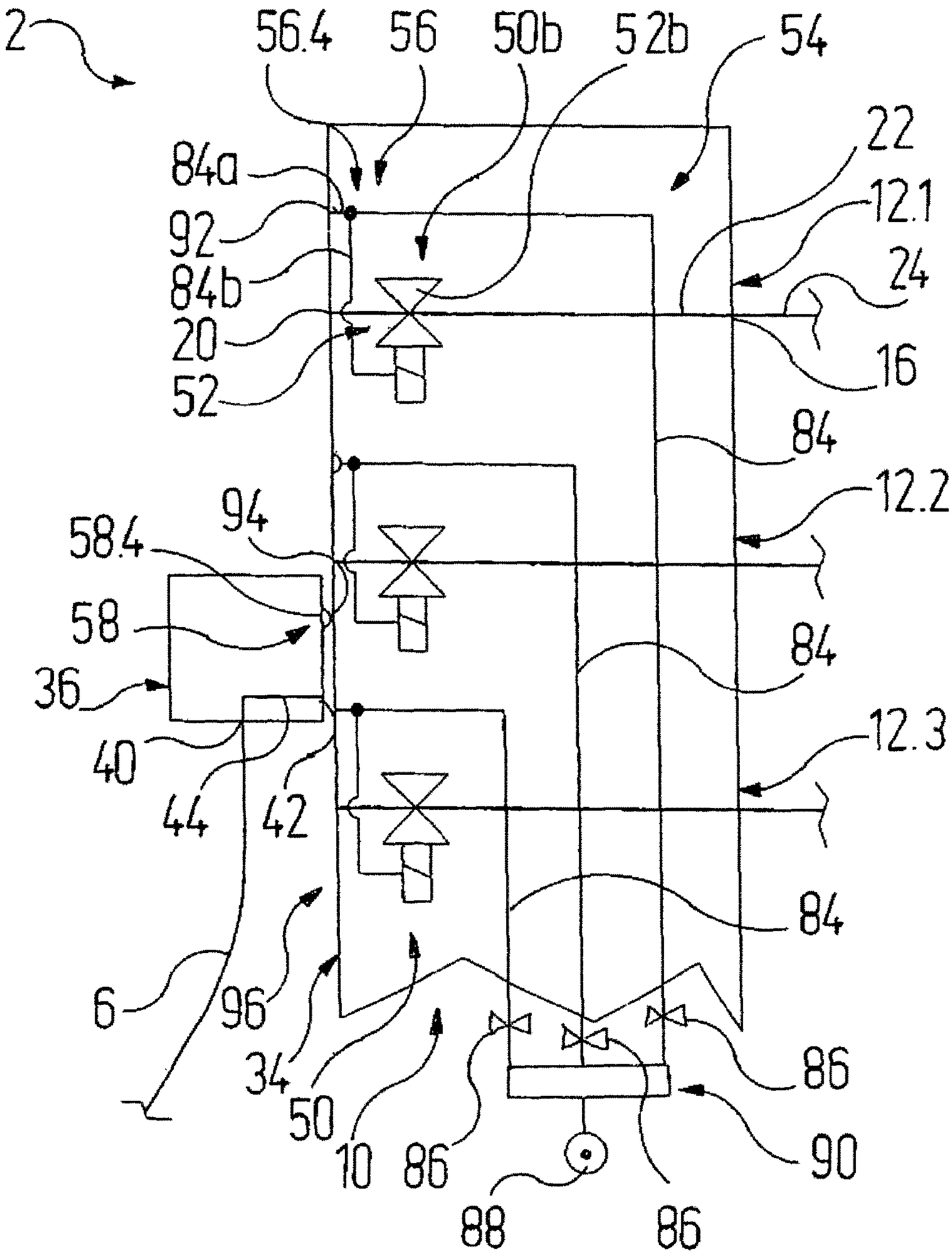
Fig. 5A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58.4
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12.3
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90
88
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Fig. 5B

CHANGING DEVICE FOR COATING MEDIA AND COATING SYSTEM FOR COATING OBJECTS

RELATED APPLICATIONS

This application is a national phase of International Patent Application No. PCT/EP2015/001566, filed Jul. 30, 2015, which claims the filing benefit of German Patent Application No. 10 2014 011 415.5, filed Jul. 31, 2014, the contents of both of which are incorporated herein by reference.

FIELD OF THE INVENTION

The invention relates to a changeover apparatus for coating media, in particular for paints, having

a) a plurality of supply units, each of which has at least one inlet connection, which can be connected to a reservoir for a medium, and an outlet connection, a flow channel extending between said connections;

b) at least one coupling unit, which has an entry connection and an exit connection, which can be connected to an application device, a through-channel extending between said connections;

c) a positioning device, by means of which the coupling unit can be moved relative to the supply units,

wherein

d) the entry connection of the coupling unit can be coupled in a fluid-tight manner to the outlet connection of a supply unit and can be separated therefrom again;

e) a valve device is present, in the case of which each supply unit comprises a valve unit which, in a release configuration, releases the flow channel and, in a closed configuration, closes said channel and which can be moved into the release configuration by means of a control signal.

The invention also relates to a coating system for coating objects, having

a) an application device;

b) a plurality of reservoirs for in each case one coating medium;

c) at least one changeover apparatus having a plurality of inlet connections, each of which is connected to a dedicated reservoir for coating medium, and having at least one exit connection, which is connected to the application device, and by means of which a coating medium can optionally be directed from a reservoir to the application device.

BACKGROUND OF THE INVENTION

Such changeover devices and coating systems are used, for example, in the automotive industry for painting vehicle bodies and the add-on parts thereof.

For example, in the case of a painting facility, use is made of a changeover device for coating media, i.e. then a color-changeover device, if it is relatively frequently the case during normal operation that, for the purpose of coating an object, use should be made of a paint other than that paint with which a previous object was painted.

It has to be reliably ensured here that a certain flow channel is released only when the coupling unit is also actually coupled to the supply unit which belongs to the flow channel in question.

SUMMARY OF THE INVENTION

An object of the invention is to create a changeover apparatus and a coating system of the type mentioned in the introduction which ensure that this takes place.

This object may be achieved in the case of a changeover apparatus of the type mentioned in the introduction in that

f) the valve device comprises a control system which

fa) has a switching device for each supply unit, said switching device, in a switching configuration, allowing the control signal through to the valve unit and, in a blocking configuration, blocking the control signal to the valve unit;

fb) has a triggering device, which is carried along by the coupling unit and which triggers at least one switching operation of the switching device from the blocking configuration into the switching configuration when the entry connection of the coupling unit is, or has been, coupled in a fluid-tight manner to the outlet connection of a supply unit.

According to the invention, the control signal may already be present at the switching device even when the coupling unit is separated from the associated supply unit. It is only when the coupling unit is moved up to a certain supply unit that the switching device is triggered during the coupling operation, or preferably following completion thereof, as a result of which the valve unit receives the control signal necessary for achieving its release configuration. As will also be explained in more detail hereinbelow, a control signal can be formed by the presence or by the absence of a control parameter. Without the specific presence of the coupling unit, however, the valve unit which is to be opened does not receive any control signal, and this significantly increases the operational reliability.

It is particularly advantageous if the valve device is an electric valve device and a valve unit of a supply unit is an electric valve which is arranged in a circuit which can be closed or interrupted by the switching device.

In the case of a first alternative, the electric valve can assume its release configuration when the circuit is closed and can assume its blocking configuration when the circuit is interrupted.

In the case of a second alternative, the electric valve can assume its blocking configuration when the circuit is closed and can assume its release configuration when the circuit is interrupted. This corresponds to the abovementioned concept where the absence of a parameter forms a control signal.

Preferably,

a) the switching device is an electric bridge device with two contact locations which are accessible from the outside;

b) the triggering device is a bridging device by means of which the contact locations of the bridging device can be connected to one another.

A technical alternative consists in that

a) the switching device is a spring-loaded switch with two contact locations and a spring-loaded, electrically conductive connecting piece, which can be moved between a position in which it connects the contact locations in a conductive manner and a position in which the circuit is interrupted;

b) the triggering device is a pressure-exerting device by means of which the connecting piece can be pushed from one position into the other position.

As an alternative, it is possible

a) for the switching device to be a magnetic switch by means of which, in one configuration, the circuit can be closed or, in one configuration, the circuit can be interrupted;

b) for the triggering device to be a magnetic actuator (**58**.**3**) by means of which the magnetic switch can be switched from one configuration into the other configuration.

As an alternative to the electric valve device, it is possible for the valve device to be a pneumatic valve device and for a valve unit of a supply unit to be a pneumatic valve which is connected to a fluid line which is supplied from a compressed-gas source.

It is advantageous here if the pneumatic valve assumes its release configuration when it is subjected to the action of compressed gas, and in that it assumes its closed configuration when there is no compressed gas present.

As a further alternative, it may be advantageous if the pneumatic valve assumes its closed configuration when it is subjected to the action of compressed gas, and in that it assumes its release configuration when there is no compressed gas present. This once again realizes the concept where the absence of a control parameter, in this case therefore the absence of pressure loading, serves as a control signal.

It is advantageous then if

a) the switching device is a fluid-pressure switch, for which purpose the fluid line forks into an outlet line, which leads to an outlet opening, and a pressure line, which leads to the valve;

b) the triggering device is a closure device with a plug element, by means of which the outlet opening can be closed.

As an alternative, it is possible

a) for the switching device to be a fluid-pressure switch, for which purpose the fluid line forks into an outlet line, which leads to an outlet opening, and a pressure line, which leads to the valve, wherein the outlet opening can be closed by a nonreturn valve with a movable closing body which, in a basic configuration, closes the outlet opening and, in an operating configuration, releases the outlet opening;

b) for the triggering device to be a pressure-exerting device with a pressure-exerting element by means of which the closing body can be moved out of the basic configuration into the operating configuration.

The object mentioned above may be achieved in the case of the coating system of the type mentioned in the introduction in that

d) the changeover apparatus is a changeover apparatus having some or all of the features explained above.

It is to be understood that the aspects and objects of the present invention described above may be combinable and that other advantages and aspects of the present invention will become apparent upon reading the following description of the drawings and detailed description of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments of the invention will be explained in more detail hereinbelow with reference to the drawings, in which:

FIG. **1** shows a schematic layout view of a coating system with a linear changeover apparatus having a plurality of supply units and a movable coupling unit;

FIG. **2**A shows a schematic layout view of a first exemplary embodiment of the changeover apparatus having a valve device and a control system, in an application configuration;

FIG. **2**B shows the changeover apparatus according to FIG. **3**A in a changeover configuration;

FIGS. **3**A and **3**B show schematically layout views, corresponding to FIGS. **2**A and **2**B, of a second exemplary embodiment of the changeover apparatus having a valve device and a control system;

FIGS. **4**A and **4**B show schematic layout views, corresponding to FIGS. **2**A and **2**B and also **3**A and **3**B, of a third exemplary embodiment of the changeover apparatus having a valve device and a control system; and

FIGS. **5**A and **5**B show schematic layout views, corresponding to FIGS. **2**A and **2**B, **3**A and **3**B and also **4**A and **4**B, of a fourth exemplary embodiment of the changeover apparatus having a control system.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail one or more embodiments with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiments illustrated.

Reference will be made first of all to FIG. **1**. There, **2** is comprehensively used to denote a coating system for applying coating media, the coating system comprising an application device **4**. In the present case, a description is given, by way of example, of a coating system **2** for paints. In this case, the application device **4** may be, for example, a spray gun or a high-speed rotary atomizer and may also operate electrostatically, as is known per se.

If the text hereinbelow refers to a connection between connections, channels or lines, it means predominantly in each case a fluidic connection between such components, corresponding flow paths being formed as a result. Terms used hereinbelow such as inlet, outlet, entry or exit, or corresponding connections, refer merely to a flow of medium in the direction of the application device. As is made clear hereinbelow, however, it is also possible for medium to flow in the other direction and, in the process, to flow out through an inlet or entry or to flow in through an outlet or exit.

The application device **4** is fed via a line **6**. The coating system **2** is operated, in a manner known per se, using pigging technology, for which reason the line **6** contains a pigging station **8**, which is assigned to the application device **4**.

At the end which is remote from the application device **4**, the line **6** is connected to a changeover apparatus **10** for coating media, said changeover apparatus, in the case of coating with paint, therefore being a color-changeover device.

The changeover device **101** comprises a plurality of supply units **12**, wherein FIGS. **1** and **2** show merely three supply units **12.1**, **12.2** and **12.3**. The changeover device **10** comprises at least two, and they may also comprise more than three, such supply units **12**. Depending on the particular application, the changeover device **10** may have, for example, 20 or even 40 such supply units **12**. The supply units **12** are identical; in FIG. **1**, it is only the supply unit **12.2** which is in the center there that is provided with further reference signs.

In the case of the present exemplary embodiment, the supply units **12** are accommodated in a common housing **14**, which is designed, for example, in the form of a housing block. It is also possible, however, for the supply units **12**

each to be designed in the form of a separate structure unit and each to have a dedicated housing or a dedicated housing block.

Each supply unit **12** has an inlet connection **16** for coating medium, a rinsing-agent connection **18** for rinsing agent, said connection not being evident in FIG. **1**, and an outlet connection **20**. The inlet connection **16** and the rinsing-agent connection **18** open out into a flow channel **22**, which leads to the outlet connection **20** and of which FIG. **1** shows a short end portion only for the supply units **12.1** and **12.2**.

The inlet connection **16** and the rinsing-agent connection **18** of a supply unit **12** can be closed or opened separately in each case by a corresponding, but not specifically shown paint-color valve and rinsing valve, respectively. For example needle valves which are known per se may be provided for this purpose, each interacting with corresponding valve seats of the inlet connection **16** and of the rinsing-agent connection **18**.

The inlet connections **16** and the rinsing-agent connections **18** of the individual supply units **12** are each connected to a dedicated paint-color reservoir **28** and a collecting container **30**, respectively, via a paint-color line **24** and a rinsing line **26**, respectively. Different paints, that is to say, in general terms, different coating materials, are provided in the respective paint-color reservoirs **28** assigned to a certain supply unit **12**. Instead of being connected in each case to a separate collecting container **30**, it is also possible for a plurality of supply units **12** to be connected to one and the same collecting container **30**. A further rinsing-agent reservoir **32** is connected to the pigging station **8** at the application device **4**.

Reservoir is understood here to mean any technical solution for supplying or accommodating different media. This therefore also includes, for example, ring-line systems, as are known per se.

The individual supply units **12** form, in a linear arrangement, a supply module **34**, via which the application device **4** can be supplied with a corresponding number of different colors.

In order to direct a color from one of the supply units **12** to the application device **4**, a coupling unit **36** is connected to that end of the line **6** which is remote from the pigging station **8**, it being possible for the supply units **12** to be coupled to the application device **4** by said coupling unit.

The coupling unit **36** comprises a pigging station **38** (not shown any more specifically) and an exit connection **40**, which is connected to the line **6**. The coupling unit **36** also comprises an entry connection **42**, which is designed to complement the outlet connections **20** of the supply units **12** and is connected fluidically via a channel **44** which can be seen in FIGS. **2** to **5**, by way of the pig housing **38**, to the exit connection **40** and, in this way, to the line **6**.

The supply units **12** and the coupling unit **36** can be moved relative to one another for a color changeover, it therefore being possible for the entry connection **40** of the coupling unit **36** to be coupled in a fluid-tight manner to the outlet connection **20** of a supply unit **12** and to be separated therefrom again.

For this purpose, the changeover device **10** comprises a positioning device **46**, which is shown only in FIG. **1** and with the aid of which, in the case of the present exemplary embodiment, the coupling unit **36** can be moved along the supply module **34** and positioned in relation to a predetermined supply unit **12**. For this purpose, in the case of the present exemplary embodiment, the coupling unit **36** is mounted in a displaceable manner in a guide rail **48**, extending parallel to the supply module **34**, and can be displaced therein with the aid of drive means which are known per se, but are not shown specifically.

The changeover apparatus **10** has a valve device **50**, in the case of which each supply unit **12** comprises a valve unit **52**. It is possible for each valve unit **52**, in a release configuration, to release the flow path **22** via the outlet connection **20** and, in a closed configuration, to close said flow path and to be moved into the release configuration by means of a control signal when the entry connection **40** of the coupling unit **36** is coupled in a fluid-tight manner to the outlet connection **20** of a supply unit **12**.

For this purpose, the valve device **50** comprises a control system which, for each supply unit **12**, has a switching device **56** which, in a switching configuration, allows the control signal through to the valve unit **52** and, in a blocking configuration, blocks the control signal to the valve unit **52**.

The control system **54** of the valve device **50** also comprises a triggering device **58**, which is carried along by the coupling unit **36** and which triggers at least one switching operation of the switching device **56** from the blocking configuration into the switching configuration when the entry connection **40** of the coupling unit **36** has been coupled in a fluid-tight manner to the outlet connection **20** of a supply unit **12**.

Reference will now be made to FIGS. **2** to **5**. For the sake of clarity, the rinsing-agent connections **18**, the rinsing lines **24**, the paint-color reservoirs **28** and the collecting containers **30** are not shown in said figures. Moreover, it is only the essential component parts and, in the case of the supply units **12**, largely only the rest of the components of the supply unit **12.1** which are provided with reference signs in each case.

FIGS. **2**A and **2**B show, as a first exemplary embodiment, an electrically operating valve device **50***a* with valve units **52** in the form of electrically actuable valves **52***a*, as are known per se. The control signal for the valves **52***a* is thus an electric signal.

The valves **52***a* are each arranged in a circuit **60**. In the case of the exemplary embodiment shown, all the circuits **60** present are formed from a conductor **60***a* in conjunction with a neutral conductor or protective conductor **60***b*, which for their part come from a common power source, which for the sake of simplicity is not shown specifically. In the case of a modification, it is also possible for each circuit **60** to have a dedicated power source. The switching devices **56** are set up such that they can close or interrupt the respective circuit **60**.

The switching device **56** is designed here in any case in the form of an electric bridge device **56.1** with two contact locations **62** and **64**, which are accessible from the outside on the side of the outlet connection **20** on the housing **14** of the supply module **34**. In the switching configuration of the bridge device **56.1**, the two contact locations **62**, **64** are connected to one another in a conductive manner, and therefore the circuit **60** is closed and the associated valve **52***a* is open. In the blocking configuration of the bridge device **56.1**, the two contact locations **62**, **64** are not connected to one another and the circuit **60** is interrupted, wherein the associated valve **52***a* then assumes its closed position. This can be achieved, for example, by the valve **52***a* being subjected to spring prestressing, as is known per se.

The triggering device **58** is designed in the form of a bridging device **58.1** by means of which the contact locations **62**, **64** can be connected to one another. In the case of the present exemplary embodiment, the bridging device **58.1** comprises has two connection contacts **68**, **70**, which are connected to one another in a conductive manner via an electric conductor **66**. Said connection contacts complement

the contact locations **62** and **64** and are fitted on the outer side of the coupling element **36**, said outer side being oriented toward the supply module **34**, such that the circuit is closed by means of the bridging device **58.1** when the entry connection **40** of the coupling unit **36** has been coupled in a fluid-tight manner to the outlet connection **20** of the supply unit **12**.

When the circuit is closed, the control signal consequently passes to the valve **52***a*, which then opens and releases the flow channel **22**. This is depicted in FIG. **2**A, which shows the changeover apparatus **10** in an application configuration, in the case of which paint is delivered from the paint-color reservoir **28** of the supply unit **12.2** to the application device **4** and can be applied to an object. The operation of the coating system **2** per se, i.e. the rinsing operations during a color changeover, the activation of other valves present, but not shown specifically, in the supply module **34** and the use of pigs between the pigging station **8** at the application device **4** and the pigging station **38** of the coupling unit **36** correspond to the prior art.

The bridging device **58.1** can basically operate in two ways. On the one hand, it can direct a signal directly to the valve **52***a*; in this case, the bridging device **58.1** closes a load circuit. On the other hand, the bridging device **58.1** can activate a further component part which is not shown specifically here and, for its part, switches the valve **52***a*; in this case, the bridging device **58.1** closes a control circuit in relation to said further component part.

For advancing media or the pig in the line system formed by the channels and lines explained above, use can be made of media pressure provided by paint, rinsing agent, air, CO_2, nitrogen and the like, which are supplied in a manner known per se. For the sake of clarity, components which are necessary for this purpose, such as media sources, lines, valves and connections, are not shown specifically in the figures.

Following completion of the application of paint from the paint-color reservoir **28** of the supply unit **12.2**, it is possible, if appropriate, for color changeover to take place to a second paint of a different color, for example to a paint from the paint-color reservoir **28** of the supply unit **12.3**.

FIG. **2**B shows the changeover apparatus **10** in a changeover configuration, in the case of which the coupling unit **36** is moved, for this purpose, from the supply unit **12.2** to the supply unit **12.3**, to which end the coupling unit **36** has been uncoupled beforehand from the supply unit **12.2**. During the operation of uncoupling the coupling unit **36** from the supply unit **12.1**, the bridging device **58.1** has also been disengaged from the contact locations **62**, **64** of the supply unit **12.1**, and therefore the valve **52***a* resumes its closed position and the flow channel **22** is in a closed state.

FIGS. **3**A and **3**B show, as a second exemplary embodiment, a modified electrically operating valve device **50***a*, which once again has valve units **52** in the form of electrically actuable valves **52***a*. Here too, therefore, the control signal is an electric signal.

The control system **54** here comprises switching devices **56** in the form of spring-loaded switches **56.2** with two inner contact locations **72**, **74** of the circuit **60** and a movable, electrically conductive connection piece **76**. The connecting piece **76** can be moved between a connecting position, in which it connects the contact locations **72**, **74** in a conductive manner in a switching configuration, and a separating position, in which the circuit is interrupted. The connecting piece **76** is retained in the separating position under prestressing action by a spring **78**.

The triggering device **58** is designed in the form of a pressure-exerting device **58.2** which, in the case of the present exemplary embodiment, has a pressure-exerting element **80** which is arranged on the coupling unit **36**, and dimensioned, such that it pushes the connecting piece **76** of the spring-loaded switch **56.2** into the connecting position when the coupling element **36**, couples, or has been coupled, to a supply unit **12**. The associated circuit **60** is then in a closed state, the valve **52***a* assumes its release configuration and the flow path through the flow channel **22** is open. FIG. **3**A shows this application configuration for the supply unit **12.2**.

When the coupling unit **36** has been disengaged from the supply unit **12.2** again for a color changeover, the spring-loaded switch **56.2** resumes its blocking configuration and the valve **52***a* closes, as is depicted in FIG. **3**A.

FIGS. **4**A and **4**B show, as a third exemplary embodiment, a further-modified electrically operating valve device **50***a*, which once again has valve units **52** in the form of electrically actuable valves **52***a*. Here too, therefore, the control signal is an electric signal.

Here, the control system **54** comprises switching devices **56** in the form of magnetic switches **56.3** which, in their switching configuration, close the respective circuit **60** and, in their blocking configuration, interrupt said circuit.

The triggering device **58** is designed in the form of a magnetic actuator **58.3** which, in the case of the present exemplary embodiment, has a permanent magnet **82** which is arranged on the coupling unit **36**, and oriented and dimensioned, such that it activates the magnetic switch **56.3** when the coupling element **36** couples, or has been coupled, to a supply unit **12**, as a result of which the magnetic switch **56.3** assumes its switching position. The associated circuit **60** is then in the closed state, and the valve **52***a* assumes its release configuration and opens the flow path through the flow channel **22**; FIG. **4**A shows this application configuration for the supply unit **12.2**.

When the coupling unit **36** has been detached from the supply unit **12.2** again for a color changeover, the magnetic switch **56.3** resumes its blocking configuration and the valve **52***a* closes; this is shown in FIG. **4**A.

As an alternative to the permanent magnet **82**, it is also possible for an electromagnet to be provided.

In the case of all exemplary embodiments explained above in relation to the electric valve device **50***a*, the conditions are such that the electric valves **52***a* assume their release configuration when the circuit **60** is closed, wherein the triggering device **58** ensures in each case that the circuit **60** is closed.

However, it is likewise possible to realize the situation where the electric valves **52***a* assume their release configuration when the circuit **60** is interrupted and the triggering device **58** ensures in each case that the circuit **60** is interrupted. In this case, the control signal is predetermined by the absence of a control parameter, i.e. by the absence of a control current, at the respective valve **52***a*. When the coupling unit **36** is detached, the circuit **60** is then in the closed state.

In the case of the spring-loaded switch **56.2** according to FIGS. **2**A and **2**B, this can be achieved in that the connecting piece **76** connects the contact locations **72**, **74** under the action of prestressing by the spring **78** and is separated from the contact locations **72**, **74**, counter to the spring force, by the pressure-exerting element **80** on the coupling unit **36**. The circuit **60** is then interrupted. When the coupling unit **36** is separated from the selected supply unit, the spring **78**

pushes the connecting piece **76** is into contact with the contact locations **72**, **74**, as a result of which the circuit **60** is in a closed state again.

In the case of the magnetic switch **56**.**3** according to FIGS. **3**A and **3**B, the magnetic switch **56**.**3** has to be configured in correspondingly reverse order, in which case it closes the circuit **60** when the magnetic actuator **58**.**3** is absent and interrupts said circuit when the magnetic actuator **58**.**3** is present.

FIGS. **5**A and **5**B, then, show, as a fourth exemplary embodiment, a pneumatically operating valve device **50***b*, the valve units **52** of which are designed in the form of pneumatically actuable valves **52***b*, as are known per se. The control signal here is therefore a pneumatic signal. In practice, such valves **52***b* are actuated by compressed air, and this will also be assumed hereinbelow. It is also possible, however, to use gases other than compressed air for the pressure medium.

The valves **52***b* are designed such that they assume their release configuration when they are subjected to the action of compressed air, and that they assume their closed configuration when there is no compressed air present.

The control system **54**, then, comprises switching devices **56** in the form of fluid-pressure switches **56**.**4**. For this purpose, each valve **52***b* present is connected to a dedicated fluid line **84**, which is supplied from a compressed-gas source **88**, in this case a compressed-air source, via a control valve **86**. In the case of the present exemplary embodiment, a single compressed-air source **88** is connected to the individual control valves **86** of the individual fluid lines **84** via a distributor **90**.

In the case of a modification, it is also possible for a dedicated compressed-air source to be provided for each fluid line **84** present, or it is possible in each case for a plurality of distributors **90** for in each case a plurality of fluid lines **84** to be fed from one compressed-air source.

The fluid lines **84** lead to a fork **92**, from where an outlet line **84***a* of the fluid line **84** runs, in the form of a first sub-line, to an outlet opening **92** on the side of the outlet connection **20** on the housing **14** of the supply module **34**. A pressure line **84***b* of the fluid line **84** extends, in the form of a second sub-line, from the fork **92** to the valve **52***b*.

The triggering device **58** is designed in the form of a closure device **58**.**4** which, in the case of the present exemplary embodiment, comprises a plug element **94**, which is designed to complement the outlet opening **92** and is arranged on the coupling unit **36** such that it closes the outlet opening **92** in a flow-tight manner when the coupling element **36** couples, or has been coupled, to a supply unit **12**.

When the associated control valve **86** is open, the valve **52***b* is subjected to full pressure, said valve consequently assuming its release configuration and releasing the flow path through the flow channel **22**; FIG. **5**A shows this application configuration for the supply unit **12**.**2**.

The control valve **86** on the distributor **90** can already be opened before the plug element **94** closes the outlet opening **92**. In this case, in the first instance compressed air flows through the outlet opening **92**, as a result of which the valve **52***b* is subjected to insufficient pressure in order to be switched into the release configuration.

It is only when the outlet opening **92** has been closed tightly by the plug element **94** that the valve **52***b* is subjected to the action of compressed air, via the pressure line **84***b*, to a sufficient extent for it to assume its release configuration. The fluid-pressure switch **56**.**4** is then present in its switching configuration. The corresponding application configuration of the changeover apparatus **10** is shown in FIG. **5**A.

When the coupling unit **36** is disengaged from the supply unit **12**.**2** again for a color changeover, it is also the case that the outlet opening **92** is released again, and therefore compressed air flows out of the fluid line **84** via the outlet opening **92**. The fluid-pressure switch **56**.**4** is then located in its blocking configuration.

The pressure at the valve **52***b* drops and the latter resumes its closed configuration, the flow channel **22** therefore being in the closed state. FIG. **5**B shows a corresponding changeover configuration of the changeover apparatus **10**.

Before the coupling unit **36** is disengaged from a supply unit **12**, it is also possible, in the first instance, for the associated control valve **86** to be closed, in which case the pressure in the fluid line **84** and at the valve **52***b* drops, said valve then assuming its closed configuration.

It is possible in principle, in the case of the valve device **50***b*, for the control valves **86** to be dispensed with and for the fluid lines **84** to be subjected to the action of compressed air on a permanent basis from the compressed-air source **88**. In this case, compressed air flows continuously out of each outlet opening **92** until one of the outlet openings **92** is closed by the coupling unit **36**.

It is also the case with the pneumatic valves **52***b* that the conditions can be reversed in relation to those which have been explained above. The pneumatic valves **52***b* may also be configured such that they assume their closed position when they are subjected to the action of compressed air, and that they assume their release position when there is no pressure present. In this case, the control signal is predetermined by the absence of a control parameter, i.e. by the absence of any pressure present, at the respective valve **52***b*.

This can be realized, for example, in that the outlet opening **92** is closed by a nonreturn valve when the coupling unit **36** has been separated from the associated supply unit **12**. The valve **52***b* is thus subjected to pressure and assumes its closed configuration. For this purpose, the nonreturn valve has a movable closing body which, in a basic configuration, closes the outlet opening **92** and, in an operating configuration, releases the outlet opening **92**.

Instead of the closure device **58**.**4**, it is then possible once again to use a pressure-exerting device **58**.**2** as the triggering device **58**. The pressure-exerting element **80** thereof is designed, if appropriate, in the form of a narrow spike, which pushes back a movable closing body of the nonreturn valve when the coupling unit **36** is coupled to the supply unit **12**. As a result, the outlet opening **92** is opened, compressed air can flow out of the line **84**, the pressure at the valve **52***b* drops and said valve then assumes its release position.

The above described switching devices **56** and triggering devices of the electric and pneumatic valve devices **50***a*, **50***b* also form together in each case a safety device, which bears the reference sign **96** for all the exemplary embodiments. The triggering device **58**, which is carried along by the coupling unit **36**, and the respective switching device **56** always ensure that it is only the flow channel **22** from which the coupling unit **36** is intended to remove material which is actually released.

This is demonstrated particularly clearly by the example of the pneumatic valve device **50***b*. It may thus be the case that the distributor **90** is subject to a control error, which opens a control valve **86** which releases compressed air to a supply unit **12** other than the one intended. This is not sufficient, however, to release the flow channel **22** of the incorrectly activated supply unit **12**, since the outlet opening **92** of said supply unit is not closed by the plug element **94** of the coupling unit **32**. This means that any unintended

discharge of material by way of a supply unit **12** is effectively prevented. This applies analogously to the electric valve device **50***a*.

The different control concepts explained above can also be combined with one another so that it is possible for various supply modules **12** to be provided with different switching devices **56** which, accordingly, interact with different triggering devices **58** on the coupling unit **36**. Said triggering devices are then carried, accordingly, to different positions of the coupling unit **36**, wherein the switching devices **56** are positioned, accordingly, in a complementary manner on the supply units **12**.

It is to be understood that additional embodiments of the present invention described herein may be contemplated by one of ordinary skill in the art and that the scope of the present invention is not limited to the embodiments disclosed. While specific embodiments of the present invention have been illustrated and described, numerous modifications come to mind without significantly departing from the spirit of the invention, and the scope of protection is only limited by the scope of the accompanying claims.

We claim:

1. A changeover apparatus for coating media comprising:

a) a plurality of supply units, each of which has at least one inlet connection, which is connectable to a reservoir for a medium, an outlet connection, and a flow channel extending between the at least one inlet connection and the outlet connection;

b) at least one coupling unit, which has an entry connection and an exit connection, which is connectable to an application device, and a through-channel extending between the entry connection and the exit connection;

c) a positioning device, by means of which the at least one coupling unit is movable relative to the plurality of supply units,

wherein

d) the entry connection of the at least one coupling unit is couplable in a fluid-tight manner to the outlet connection of a supply unit and is separable therefrom again;

e) a valve device is present, providing that each supply unit comprises a valve unit which, in a release configuration, releases the flow channel and, in a closed configuration, closes said channel and which is movable into the release configuration by means of a control signal,

further wherein

f) the valve device comprises a control system which

fa) has a switching device for each supply unit, said switching device, in a switching configuration, allowing the control signal through to the valve unit and, in a blocking configuration, blocking the control signal to the valve unit;

fb) has a triggering device, which is carried along by the at least one coupling unit and which triggers at least one switching operation of the switching device from the blocking configuration into the switching configuration when the entry connection of the coupling unit is, or has been, coupled in a fluid-tight manner to the outlet connection of a supply unit from the plurality of supply units, wherein

the valve device is an electric valve device and the valve unit of each supply unit is an electric valve which is arranged in a circuit which is closable or interruptible by the switching device and the electric valve assumes its release configuration when the circuit is closed and assumes its blocking configuration when the circuit is interrupted,

the switching device is an electric bridge device with two contact locations which are accessible from the outside; and

the triggering device is a bridging device by means of which the contact locations of the bridging device are connectible to one another.

2. A changeover apparatus for coating media comprising:

a) a plurality of supply units, each of which has at least one inlet connection, which is connectable to a reservoir for a medium, an outlet connection, and a flow channel extending between the at least one inlet connection and the outlet connection;

b) at least one coupling unit, which has an entry connection and an exit connection, which is connectable to an application device, and a through-channel extending between the entry connection and the exit connection;

c) a positioning device, by means of which the at least one coupling unit is movable relative to the plurality of supply units,

wherein

d) the entry connection of the at least one coupling unit is couplable in a fluid-tight manner to the outlet connection of a supply unit and is separable therefrom again;

e) a valve device is present, providing that each supply unit comprises a valve unit which, in a release configuration, releases the flow channel and, in a closed configuration, closes said channel and which is movable into the release configuration by means of a control signal,

further wherein

f) the valve device comprises a control system which

fa) has a switching device for each supply unit, said switching device, in a switching configuration, allowing the control signal through to the valve unit and, in a blocking configuration, blocking the control signal to the valve unit;

fb) has a triggering device, which is carried along by the at least one coupling unit and which triggers at least one switching operation of the switching device from the blocking configuration into the switching configuration when the entry connection of the coupling unit is, or has been, coupled in a fluid-tight manner to the outlet connection of a supply unit from the plurality of supply units, wherein

the valve device is an electric valve device and a valve unit of a supply unit is an electric valve which is arranged in a circuit which is closable or interruptible by the switching device and the electric valve assumes its release configuration when the circuit is closed and assumes its blocking configuration when the circuit is interrupted,

the switching device is a spring-loaded switch with two contact locations and a spring-loaded, electrically conductive connecting piece, which is movable between a position in which it connects the two contact locations in a conductive manner and a position in which the circuit is interrupted; and

the triggering device is a pressure-exerting device by means of which the connecting piece is pushable from one position into the other position.

3. A changeover apparatus for coating media comprising:

a) a plurality of supply units, each of which has at least one inlet connection, which is connectable to a reservoir for a medium, an outlet connection, and a flow channel extending between the at least one inlet connection and the outlet connection;

b) at least one coupling unit, which has an entry connection and an exit connection, which is connectable to an application device, and a through-channel extending between the entry connection and the exit connection;

c) a positioning device, by means of which the at least one coupling unit is movable relative to the plurality of supply units,

wherein

d) the entry connection of the at least one coupling unit is couplable in a fluid-tight manner to the outlet connection of a supply unit and is separable therefrom again;

e) a valve device is present, providing that each supply unit comprises a valve unit which, in a release configuration, releases the flow channel and, in a closed configuration, closes said channel and which is movable into the release configuration by means of a control signal,

further wherein

f) the valve device comprises a control system which

fa) has a switching device for each supply unit, said switching device, in a switching configuration, allowing the control signal through to the valve unit and, in a blocking configuration, blocking the control signal to the valve unit;

fb) has a triggering device, which is carried along by the at least one coupling unit and which triggers at least one switching operation of the switching device from the blocking configuration into the switching configuration when the entry connection of the coupling unit is, or has been, coupled in a fluid-tight manner to the outlet connection of a supply unit from the plurality of supply units, wherein

the valve device is an electric valve device and a valve unit of a supply unit is an electric valve which is arranged in a circuit which is closable or interruptible by the switching device and the electric valve assumes its blocking configuration when the circuit is closed and assumes its release configuration when the circuit is interrupted,

the switching device is a spring-loaded switch with two contact locations and a spring-loaded, electrically conductive connecting piece, which is movable between a position in which it connects the contact locations in a conductive manner and a position in which the circuit is interrupted; and

the triggering device is a pressure-exerting device by means of which the connecting piece is pushable from one position into the other position.

4. A changeover apparatus for coating media comprising:

a) a plurality of supply units, each of which has at least one inlet connection, which is connectable to a reservoir for a medium, an outlet connection, and a flow channel extending between the at least one inlet connection and the outlet connection;

b) at least one coupling unit, which has an entry connection and an exit connection, which is connectable to an application device, and a through-channel extending between the entry connection and the exit connection;

c) a positioning device, by means of which the at least one coupling unit is movable relative to the plurality of supply units,

wherein

d) the entry connection of the at least one coupling unit is couplable in a fluid-tight manner to the outlet connection of a supply unit and is seperable therefrom again;

e) a valve device is present, providing that each supply unit comprises a valve unit which, in a release configuration, releases the flow channel and, in a closed configuration, closes said channel and which is movable into the release configuration by means of a control signal,

further wherein

f) the valve device comprises a control system which

fa) has a switching device for each supply unit, said switching device, in a switching configuration, allowing the control signal through to the valve unit and, in a blocking configuration, blocking the control signal to the valve unit;

fb) has a triggering device, which is carried along by the at least one coupling unit and which triggers at least one switching operation of the switching device from the blocking configuration into the switching configuration when the entry connection of the coupling unit is, or has been, coupled in a fluid-tight manner to the outlet connection of a supply unit from the plurality of supply units, wherein

the valve device is an electric valve device and a valve unit of a supply unit is an electric valve which is arranged in a circuit which is closable or interruptible by the switching device and the electric valve assumes its blocking configuration when the circuit is closed and assumes its release configuration when the circuit is interrupted,

the switching device is a magnetic switch by means of which, in one configuration, the circuit is closable, or in one configuration, the circuit is interruptible; and

the triggering device is a magnetic actuator by means of which the magnetic switch is switchable from one configuration into the other configuration.

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